P-ISSN: 2617-9806
E-ISSN: 2617-9814

Impact Factor: RJIF 5.89
www.nursingjournal.net

International Journal of Advance Research in Nursing

Volume 8; Issue 2; Jan-Jun 2025; Page No. 1041-1045

Received: 02-09-2025
Accepted: 05-10-2025

Indexed Journal
Peer Reviewed Journal

# A Pilot Study to evaluate the effectiveness of nursing intervention package on knowledge, attitude, and application of nursing officers regarding Catheter-associated Urinary Tract Infection (CAUTI) Care Bundle in selected hospitals in Rajasthan

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**DOI:** https://www.doi.org/10.33545/nursing.2025.v8.i2.J.608

**Abstract**

**Background**: With a frequency estimated at 1-10% and accounting for 30-40% of all HCAIs reported by hospital settings, urinary tract infections (UTIs) are among the most frequent HCAIs. Patients who have a catheter placed and remained in place for 48 hours or more are defined as CAUTI according to the Centers for Disease Control and Prevention (CDC). Present study is a pilot project with an aim to assess the effectiveness of nursing intervention package on knowledge, attitude, and application of nursing officers regarding Catheter-associated Urinary Tract Infection (CAUTI) Care Bundle in selected hospitals of Rajasthan.

**Method**: This was quasi-experimental research in which total 40 nursing officers were recruited by using non-probability convenient sampling technique and then randomly allocated to two groups the experimental and control group. Experimental group has received an intervention named as nursing intervention package of 4-weeks. The pre-test and post-test data were collected by developed tools which is also checked for their feasibility by this pilot study. These tools were Structured Knowledge Questionnaire (SKQ), Attitude Likert Scale (ALS) and Application Assessment Check-List (AAC).

**Results:** The analyzed data revealed that the mean difference in between experimental group was 11.95, 11.26 & 15.46 while in control group it was 1.77, 1.16 & 1.95 for knowledge, attitude and application, respectively. The F ratio was 14.62, 15.19 & 19.37 for knowledge, attitude and application, respectively while comparison attempted in between experimental and control group.

**Conclusion:** The study concluded that the provided nursing intervention package found effective to improve the knowledge, attitude, and application of nursing officers regarding Catheter-associated Urinary Tract Infection (CAUTI) Care Bundle and recommended to investigate this study at larger scale to strengthen the evidences.

**Keywords:** Knowledge; attitude; application; nursing officers; Catheter-associated Urinary Tract Infection (CAUTI) Care Bundle

## Introduction

Healthcare-Associated Infections (HAIs) represent a critical worldwide problem to patient safety and the quality of healthcare. Notwithstanding progress in medical technology and infection control measures, healthcare-associated infections (HAIs) persist in exacerbating morbidity, mortality, extended hospitalisations, and elevated healthcare expenditures [1]. Catheter-Associated Urinary Tract Infection (CAUTI) is one of the most prevalent and avoidable healthcare-associated illnesses. The urinary catheter, although crucial for the care of critically sick and immobilised patients, is a significant source of infection if not managed with appropriate aseptic technique [2]. Preventing CAUTI is an essential aspect of nursing care, requiring a thorough comprehension and rigorous compliance with evidence-based infection control protocols. CAUTIs constitute between 30–40% of all nosocomial infections, imposing a significant strain on global healthcare systems. The Centres for Disease Control and Prevention (CDC) reports that around 75% of urinary tract infections contracted in hospitals are linked to the use of an indwelling urine catheter [3]. The presence of a catheter provides a direct pathway for germs to infiltrate the bladder, resulting in infection, sepsis, or even fatal outcomes in extreme instances. Research indicates that the chance of acquiring a urinary tract infection escalates by 3–10% for each day a catheter is retained [4]. In low- and middle-income nations such as India, the issue is exacerbated by constrained resources, insufficient infection monitoring, and inconsistent compliance with catheter care procedures. These considerations underscore the pressing need for organised educational and interventional initiatives among nursing staff to improve adherence to CAUTI prevention protocols [5].

In India, Catheter-Associated Urinary Tract Infections substantially contribute to hospital-acquired morbidity. Data

from tertiary care hospitals reveal that CAUTI rates fluctuate between 4 and 10 cases per 1,000 catheter-days, often highlighting deficiencies in nursing practice, education, and compliance with infection control protocols. [6, 7] The Indian Council of Medical Research (ICMR) and the National Centre for Disease Control (NCDC) have underscored the need of executing infection prevention and control (IPC) bundles to mitigate healthcare-associated infections (HAIs), particularly CAUTI [8, 9]. However, successful implementation largely depends on the nursing staff, who are primarily responsible for the insertion, maintenance, and removal of catheters. Nursing officers have a crucial role in maintaining aseptic catheter care; nevertheless, their expertise and attitudes often fluctuate because to variations in training, workload, and institutional norms. Enhancing their proficiency via organised nurse intervention packages is crucial to close these practice gaps [7, 8, 10].

Nursing officers are fundamental to hospital infection reduction initiatives. Their daily clinical duties encompassing patient evaluation, catheter placement, management, and prompt removal directly affect infection outcomes. Nevertheless, research has shown that while possessing sufficient theoretical knowledge, nurses sometimes lack the practical application and favourable disposition required for persistent compliance with CAUTI prevention packages [11]. Ongoing education and practical training programs have shown a substantial increase in compliance and clinical performance. An organised nursing intervention program, consisting of theoretical education, demonstration, and reinforcement via feedback and assessment, may significantly improve nurses' knowledge, attitudes, and practical abilities. These strategies enhance patient outcomes and cultivate a culture of safety and responsibility within healthcare organisations [12].

The prevention of CAUTI is a complex procedure requiring both technical expertise and a shift in attitudes among healthcare professionals. In several hospital environments, regular audits and infection control evaluations indicate ongoing non-compliance with catheter care protocols, often attributed to a lack of knowledge, inadequate training, or misunderstandings about sterile techniques [13]. Implementing a comprehensive nurse intervention package to address these deficiencies is both urgent and essential. Assessing the efficacy of this program may provide evidence-based insights on the significance of ongoing nurse education in infection control. The study's results may provide a basis for institutional policy formulation, enhance patient safety, and aid in attaining the national objective of decreasing healthcare-associated infections in accordance with the National Quality Assurance Standards (NQAS) and Infection Control Guidelines of India [13,14]. Therefore, researcher has attempted to lead this pilot study with an objective to assess the effectiveness of nursing intervention package on knowledge, attitude, and application of nursing officers regarding Catheter-associated Urinary Tract Infection (CAUTI) Care Bundle in selected hospitals of Rajasthan.

## Materials and Methods

Quantitative research with quasi-experimental research design with Non-Equivalent Control Group Pre-Test and Post-Test Design was adopted for the study. By using non-probability Convenient sampling technique, the researcher recruited 40 samples for the study later these samples were randomly allocated to two groups (20 nursing officers in each group) named as experimental and control group. The study participants were the nursing officers from selected hospitals of Rajasthan. Implementation of nursing intervention package was an independent variable while the knowledge, attitude, and application of nursing officers about CAUTI care bundle worked as dependent variable. Study instruments assessed for validity and reliability and categorized into four sections viz. Section I (Socio-demographic variables) section-II (Structured Knowledge Questionnaire) Section-III-(Attitude Likert Scale (ALS)) Section-IV- (Application Assessment Check-List (AAC)) and Nursing intervention package. Pre-test assessment knowledge, attitude and application were measured and then nursing intervention package were administered to each participant in experimental group. The nursing intervention package consisted training for 4 weeks. Post-test was done on 28th day. The gathered data was analyzed in SPSS-23 version.

## Results and Discussion

Obtained information were analyzed and grouped as per objectives of the study. The result reflected in tabular and graphics form. Table-1 communicated the frequency of socio- demographic variables of study participants.

**Table 1:** Frequency and Percentage Distribution of Socio-Demographic Variables among nursing officers N-40

| Socio-demographic Variable | | Exp. Group (N-20) | | Control Group (N-20) | |
|---|---|---|---|---|---|
| | | Frequency | Percentage | Frequency | Percentage |
| Age in Years | 20 to 23 years | 3 | 15 | 4 | 20 |
| | 24-26 years | 7 | 35 | 6 | 30 |
| | 27-30 | 8 | 40 | 9 | 45 |
| | >30 years | 2 | 10 | 1 | 05 |
| Gender | Male | 5 | 25 | 3 | 15 |
| | Female | 15 | 75 | 17 | 85 |
| Type of family | Joint family | 4 | 20 | 7 | 35 |
| | Nuclear family | 16 | 80 | 13 | 65 |
| Religion | Hindu | 13 | 65 | 15 | 75 |
| | Muslim | 2 | 10 | 1 | 05 |
| | Christian | 5 | 25 | 4 | 20 |
| Marital Status | Unmarried | 4 | 20 | 1 | 05 |
| | Married | 16 | 80 | 19 | 95 |
| Family monthly income (in rupees) | < 20,000 | 6 | 30 | 4 | 20 |

| | | | | | |
|---|---|---|---|---|---|
| | 20,001 to 30,000 | 8 | 40 | 8 | 40 |
| | 30,001 to 40,000 | 2 | 10 | 3 | 15 |
| | > 40,001 | 4 | 20 | 5 | 25 |
| Educational background | GNM | 11 | 55 | 10 | 50 |
| | B.Sc. Nursing | 4 | 20 | 6 | 30 |
| | Post Basic B.Sc. Nursing | 4 | 20 | 3 | 15 |
| | M.Sc. Nursing | 1 | 05 | 1 | 05 |
| Current designation | Staff nurse | 17 | 85 | 15 | 75 |
| | In-charge | 1 | 05 | 3 | 15 |
| | ANS/DNS | 1 | 05 | 1 | 05 |
| | NS | 1 | 05 | 1 | 05 |
| Present area of working | Ward | 12 | 60 | 13 | 65 |
| | Critical care Units | 6 | 30 | 4 | 20 |
| | OT | 2 | 40 | 3 | 15 |
| Clinical experience in years? | 2 to 5 years | 3 | 15 | 4 | 20 |
| | 5 to 8 years | 7 | 35 | 6 | 30 |
| | 8 to 10 years | 8 | 40 | 9 | 45 |
| | >10 years | 2 | 10 | 1 | 05 |
| Did you take any training regarding CAUTI care bundle? | Yes | 0 | 00 | 0 | 00 |
| | No | 20 | 100 | 20 | 100 |

Data presented in Table I stated that among both groups' maximum participants 40% (8) were having their monthly income in between 20,001/- to 30,000/- and none of the participant had undergone any training regarding CAUTI care bundle. While other variables in experimental group shows that maximum participants 40% (8) were belongs to 27 to 30 years of age group, majority of them were 75% (15) were female, max number of participants 80% (16) were living in nuclear family, highest of them 65% (13) were belongs to Hindu religion, majority of them 80% (16) were married, max number of participants 55% (11) were having GNM as their highest educational qualification, highest of them 85% (17) were at working as staff nurses, highest of them 60% (12) were presently working in wards, and majority of them 40% (8) were having clinical experience in between 8 to 10 years. Whereas in control group, it revealed that maximum participants 45% (9) were belongs to 27 to 30 years of age group, majority of them were 85% (17) were female, max number of participants 65% (13) were living in nuclear family, highest of them 75% (15) were belongs to Hindu religion, majority of them 95% (19) were married, max number of participants 50% (10) were having GNM as their highest educational qualification, highest of them 75% (15) were at working as staff nurses, highest of them 65% (13) were presently working in wards, and majority of them 45% (9) were having clinical experience in between 8 to 10 years.

**Table 2:** Frequency and percentage distribution at pre-test and post-test level of knowledge of nursing officers regarding CAUTI care bundle among experimental and control group N-40

| Level of Knowledge | Pre-test | | | | Post-test | | | |
|---|---|---|---|---|---|---|---|---|
| | Experimental group (N-20) | | Control group (N-20) | | Experimental group (N-20) | | Control group (N-20) | |
| | f | % | f | % | f | % | f | % |
| Inadequate Knowledge | 16 | 80 | 17 | 85 | 1 | 05 | 16 | 80 |
| Average knowledge | 1 | 05 | 1 | 05 | 2 | 10 | 2 | 10 |
| Adequate knowledge | 3 | 15 | 2 | 10 | 17 | 85 | 2 | 10 |

Table II stated that during pre-test in experimental group the majority of samples 80% (16) were reflecting inadequate knowledge, and after intervention the maximum number of participants 85% (17) were having adequate knowledge whereas among control group in pre-test and post-test the maximum participants 85% (17) and 80% (16) were falling under inadequate knowledge category, respectively.

**Table 3:** Frequency and percentage distribution at pre-test and post-test level of attitude of nursing officers regarding CAUTI care bundle among experimental and control group N-40

| Level of attitude | Pre-test | | | | Post-test | | | |
|---|---|---|---|---|---|---|---|---|
| | Experimental group (N-20) | | Control group (N-20) | | Experimental group (N-20) | | Control group (N-20) | |
| | f | % | f | % | f | % | F | % |
| Non-favorable attitude | 14 | 70 | 15 | 75 | 1 | 05 | 14 | 70 |
| Neutral attitude | 5 | 25 | 3 | 15 | 1 | 05 | 4 | 20 |
| Favorable attitude | 1 | 05 | 2 | 10 | 18 | 90 | 2 | 10 |

Table III stated that during pre-test in experimental group the most of respondents 70% (14) were reflecting non-favorable attitude, and after intervention the highest number of participants 90% (18) were having favorable attitude whereas among control group in pre-test and post-test the majority of participants 75% (15) and 70% (14) were falling under non-favorable attitude category, respectively.

**Table 4:** Frequency and percentage distribution at pre-test and post-test level of application of nursing officers regarding CAUTI care bundle among experimental and control group N-40

| Level of application | Pre-test | | | | Post-test | | | |
|---|---|---|---|---|---|---|---|---|
| | Experimental group (N-20) | | Control group (N-20) | | Experimental group (N-20) | | Control group (N-20) | |
| | f | % | f | % | f | % | F | % |
| Poor practice | 17 | 85 | 18 | 90 | 1 | 05 | 16 | 80 |
| Average practice | 2 | 15 | 1 | 05 | 1 | 05 | 3 | 15 |
| Good practice | 1 | 05 | 1 | 05 | 18 | 90 | 1 | 05 |

Table IV stated that during pre-test in experimental group the many of respondents 85% (17) were showing poor practice, and after intervention the maximum number of participants 90% (18) were having good practice whereas among control group in pre-test and post-test the most of participants 90% (18) and 80% (16) were falling under poor practice category, respectively.

**Table 5:** Comparing of pre-test and post-test of level of knowledge, attitude and application of nursing officers regarding CAUTI care bundle among experimental and control group N-40

| Outcome variable | Two Groups | Mean | | Mean Difference | d.f. | F Ratio |
|---|---|---|---|---|---|---|
| | | Pre-test | Post-test | | | |
| Knowledge | Experimental Group | 14.19 | 26.14 | 11.95 | 1 | 14.62* |
| | Control Group | 13.55 | 15.32 | 1.77 | | |
| Attitude | Experimental Group | 12.92 | 24.18 | 11.26 | 1 | 15.19* |
| | Control Group | 11.38 | 12.54 | 1.16 | | |
| Application | Experimental Group | 11.48 | 26.94 | 15.46 | 1 | 19.37* |
| | Control Group | 10.74 | 12.68 | 1.94 | | |

** Significant at level of <0.05*

Table V reflected a comparison among experimental group and control group. It found that the mean difference for knowledge, attitude and application among experimental group was 11.95, 11.26 & 15.46 while in control group it was 1.77, 1.16 & 1.95 respectively. The F ratio identified as 14.62, 15.19 & 19.37 for knowledge, attitude and application respectively, which reflected that among both the group, there is significant difference in terms of level of knowledge, attitude and application among nursing officers, hence statically it found that nursing intervention package is effective to improve knowledge, attitude and application of nursing officers regarding CAUTI care bundles.

## Discussion

Present pilot study analysis revealed that the provided nursing intervention package is found effective to improve knowledge, attitude and application of nursing officers regarding CAUTI care bundles and the mean difference in between experimental group was 11.95, 11.26 & 15.46 while in control group it was 1.77, 1.16 & 1.95 for knowledge, attitude and application, respectively. The F ratio was 14.62, 15.19 & 19.37 for knowledge, attitude and application, respectively while comparison attempted in between experimental and control group. A study has shown somewhat similar result by Zegeye *et al* showed that nurses had good knowledge and applications about CAUTI prevention at 37.7% and 51.8%, respectively. The authors concluded that over half of nurses application effective CAUTI prevention and that over one-third of nurses had strong understanding of the subject [15]. Another study stated similarly reported that prior to the intervention, none shown sufficient understanding of CAUTI, which increased to 15% thereafter. Adequate practice increased from 38% before to the intervention to 85% after the intervention. The multimodal intervention significantly enhanced nurses' knowledge and practice. Concerning urinary catheter management, emphasising its capacity to enhance CAUTI preventive efforts. [16] A research shown that a paired T-test was conducted to assess the differences in knowledge, perception, and application of nurses and physicians about catheter indications and CAUTI prevention before and after the intervention. The findings demonstrated a substantial disparity between the test scores of pre- and post-intervention, as the P-value is 0.0 [17].

## Limitations of the study

Present study limited to:

- Selected nursing officers of selected hospitals of Rajasthan.
- Only 40 nursing officers who were present during the time of data gathering process.

## Conclusion

Investigator focused on findings and suggesting that the intervention nursing intervention package found effective to improve knowledge, attitude and application of nursing officers regarding CAUTI care bundles. This pilot study provided all possible evidences to test the developed nursing intervention package by organizing a larger sample study to enhance the probability of generalization.

## Acknowledgement

Researcher would like to acknowledge untried support and guidance of Nirwan university along with My PhD Supervisor.

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**How to Cite This Article**
Bharadwaj V, Jasmin. A Pilot Study to evaluate the effectiveness of nursing intervention package on knowledge, attitude, and application of nursing officers regarding Catheter-associated Urinary Tract Infection (CAUTI) Care Bundle in selected hospitals in Rajasthan. International Journal of Advance Research in Nursing. 2025;7(2): 1041-1045